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AFRICAN VEGETATION.

Die Vegetation der Erde. Sammlung pflanzengeographischer Monographien. By Prof. A. Engler and Prof. O. Drude. ix., Die Pflanzenwelt Afrikas, insbesondere seiner tropischen Gebiete. Grundzüge der Pflanzenverbreitung in Afrika und die Charakterpflanzen Afrikas. By A. Engler. Band i., Allgemeiner Überblick über die Pflanzenwelt Afrikas und ihre Existenzbedingungen. 1 Hälfte (Heft i.), pp. xxviii+478. 2 Hälfte (Heft ii., und iii.), pp. xii+479–1029. (Leipzig: W. Engelmann, 1910.)

THE botany of Africa, especially of tropical Africa, has for the last twenty years attracted much attention among systematists, both in this country and on the Continent of Europe. The important and exhaustive "Floras" of South and Tropical Africa organised at Kew have, after a period of abeyance, progressed steadily towards completion. Many books and papers dealing with more restricted areas have been published, such as the enumeration of Dr. Welwitsch's Angolan collections, the important work on the vegetation of German East Africa, edited by Dr. Engler, of Berlin, and Dr. Wildemann's finely illustrated volumes on the botany of the Congo region. The results of various expeditions, many of which have been largely due to individual effort, have also added much to the botanical literature of this great continent. Towards the achieving of these results no one has worked harder or displayed greater zest than Dr. Engler. Not only has he made good use of the members of his staff at the Berlin Botanical Museum in working up the great mass of material which has been collected chiefly from the German colonies, but has also himself made botanical expeditions in various parts of the continent. Dr. Engler was therefore eminently fitted to prepare a general account of the vegetation of Africa, and the two substantial volumes in which this account is embodied form a valuable addition to the important series of monographs on plant geography issued under his own and Prof. Oscar Drude's editorship.

The greater part of the book, to be precise 870 out of a total of 1019 pages, is occupied with the introduction, a general review of the vegetation of the continent. This takes the form of a series of chapters descriptive of the vegetation of as many areas differing largely in size and importance. Chapter i. (pp. 1–50) deals with Mediterranean Africa, from Morocco to Egypt, and the Sahara. Chapter ii. (pp. 51–478), "Tropical East Africa to Eastern Capeland," deals with the vast area extending from Nubia and Somaliland to the Karroo district of Cape Colony, and includes among its principal subdivisions the Abyssinian flora, the floras of the Somali peninsula, of the Masai highlands, of German East Africa, Nyasaland, Portuguese East Africa, Rhodesia, the east Kalahari district, and the Karroo. The rich and characteristic flora of south-west Cape Colony forms the subject of the third chapter, while the fourth—"the extra-tropical and tropical summer-rain district of West Africa"—is concerned with the enormous area stretching from Namaqualand and Hereroland to Senegambia, and including the Huilla highlands, Angola, the Congo basin, the area of central tropical Africa from the Upper Congo to Uganda and the Great Lakes, the Ruwenzori district, the Cameroons (treated in some detail), Central Guinea or Togoland, Upper Guinea, and Senegambia. The fifth and last chapter deals with the vegetation of the Cape Verdes, the Canary Islands, and Madeira.

A perfect uniformity of treatment of these numerous and widely different areas, some only of which have been indicated above, could not be expected, and Dr. Engler is naturally most exhaustive in dealing with provinces the botany of which he has had most opportunity of knowing, namely, those under German government in East and West Africa. But his review as a whole forms a valuable *résumé* of the work which has been done on the botany of the various parts of the African continent, and gives, so far as is possible from the data to hand, a useful account of the chief characteristics of their vegetation. It shows not only what has been done, but, a matter of equal importance, what still remains to be done. Perhaps the most striking feature of this portion of the work is the wealth of illustration; the pictures occupy almost if not quite as much space as the text. There are more than fifty whole-page plates, beautiful photographic reproductions of vegetation, plant associations, or landscape. In addition there are more than 700 text figures, many of which occupy a full page; these illustrate habit or form of individual plants, or are botanical analyses of one or more species. The illustrations alone give a good idea of the characters of the vegetation of the district under discussion. Mention should also be made of the carefully elaborated list of botanical collectors classified according to districts, which precedes the text proper. Associated with this is a map indicating the routes and collecting stations of the more important collectors. Three other maps illustrate the vegetation of German South-West Africa, the Cameroons, and Togoland respectively.

The comparatively small portion of the book which remains after the introduction, is divided into four parts. Part i. deals mainly with climate—temperature and rainfall—of the tropical and north and south extra-tropical areas; it also includes a chapter on the nature of the soil. Part ii. gives a brief general account of the vegetation of a series of altitudinal regions—tropical rain forest, tropical steppe region, subtropical bush and grass region, subtropical high forest region, and subalpine and alpine regions. Part iii. deals similarly with the various formations—halophilous, including littoral and interior (such as occur in the Sahara in the north, and the Kalahari in the south); hydrophilous, including alluvial forest, marshland, lake, and river vegetation; hygrophilous megatherm, the evergreen rain-forest vegetation; hygrophilous mesotherm—the bamboo forest, high mountain bush, and damp meadow vegetation of the higher regions of the tropical mountains or the slopes

of the subtropical; subxerophilous, such as occur in districts with a short rain season of three to four months or a limited mist formation—a very extensive and diverse series, including the grass steppes at different altitudes, the dry wood- and bush-formations, and subalpine and alpine areas; and, finally, the true xerophilous formations. The fourth and last part contains an elaborate series of lists of orders and genera displaying the various component elements of the African flora, such as a general tropical element, palæotropic, African - Asiatic, African - Malagasy, American-African, Mediterranean-African, endemic tropical, and others. There is also a short sketch of the development of the African flora.

The difficult problem of indexing so extensive and elaborate a sytematic work has been solved by supplying an exhaustive table of contents and by confining the index to names of plants which are figured in the text. A. B. R.

THE ALTERNATE-CURRENT TRANSFORMER.

Transformers: a Treatise on the Theory, Construction, Design, and Uses of Transformers, Auto-transformers, and Choking Coils. By Prof. H. Bohle and Prof. D. Robertson. Pp. xiv+356+Tables A and B+18 plates. (London: C. Griffin and Co., Ltd., 1911.) Price 21*s.* net.

THIS very complete treatise on the alternate current or static transformer will no doubt be found of considerable value in the drawing office of practical transformer builders, and also by teachers and advanced students. Whoever uses it, however, will have to possess time and patience as well as very good eyesight to master the symbolical notation the authors have seen fit to employ, which to most ordinary readers will prove in certain respects exasperating. In dealing with simple periodic or variable quantities, such as alternating currents, electromotive forces, and fluxes, a widely used custom has been adopted of employing small letters for instantaneous values and corresponding large ones for the maximum values, and either brackets or bars over a letter to denote R.M.S. values. The authors of this book have adopted the plan of printing a little ^{I} inside the capital letter to denote the instantaneous value, and a little ^{M} to denote the maximum value. These special symbols are for most eyes quite illegible without the aid of a magnifying glass, and can only be described as producing the maximum amount of eye and mind strain to read them.

Again, most mathematical writers now employ block letters or clarendon type to signify vectors, but the authors of this book have turned their backs on this useful practice, and used block letters such as **T** and **N** to signify scalar quantities such as time, or mere numerics such as number of turns. This may seem to the non-mathematician to be a small matter, but at a time when an International Committee is endeavouring to obtain something like order and uniformity in technical symbolisation, it is a great pity for any authors to display an exuberance of ingenuity in devising symbols which have never been used before, and are not likely to be used again.

Apart, however, from the difficulties of perusal introduced by this deviation from beaten paths, the authors have produced a book which has many valuable qualities. It is characterised by admirable illustrations prepared from photographs of actual transformers, parts, and appliances, and also by excellent plates giving working drawings of transformers in use, which are rendered all the more useful by appended millimetre and inch scales.

There are also a large number of curves delineating the co-variation of pairs of important quantities.

The book is divided into twelve chapters covering general principles, magnetising and no-load currents, losses in transformers, temperature rise, magnetic leakage, transformer vector diagrams, systematic testing, insulating materials, examples of construction, design of transformers, applications of transformers, and polycyclic systems. Having regard to the fact that so much has been written on the subject of transformers, there is a remarkable absence of all references, either in footnote or text, to the work and writings of previous authors.

The subject of the alternate-current transformer has been treated from the point of view of theory and of the student with such completeness in the works of Blakesley, Fleming, Kapp, Bedell, Bedell and Pierce, Rhodes, and many others that the chief room for addition seemed to be in a practical treatise on the design of transformers, giving rules for the systematic predetermination of all dimensions and quantities to a prescribed specification.

This the authors have done in their chapter x., and have added also complete worked out specifications for transformers and choking coils of various sizes and types. These, however, would have been rendered more valuable if the actual results of tests of these transformers had been given to show how far the predetermined values agree with measured ones.

The chapter on testing of transformers seems deficient in not laying sufficient stress upon the measurement of secondary drop or giving good methods for determining it at all loads. When transformers have to be banked to work in parallel, the identity in their drop curves is most important, as otherwise one or more transformers may be overloaded or may overheat. Bragstad's and Kapp's diagrams for transformer regulation are, however, given and explained in the chapter on transformer diagrams.

It would require much time and, in addition, considerable expense to check or test the formulæ given by the authors for dimensions of transformers to comply with certain specified requirements, but the results are for the most part embodied or condensed into tables, which the practical transformer manufacturer can speedily bring into comparison with practice. The book, however, in many respects fills a distinct gap in transformer literature, and will no doubt be of great use to draughtsmen who are responsible for overhauling or improving a line of stock transformers to reduce cost or improve their working. It only remains to add that the book is excellently printed, and in this respect a model of what technical publications should be.